European Parliament

Sustainable aviation fuels

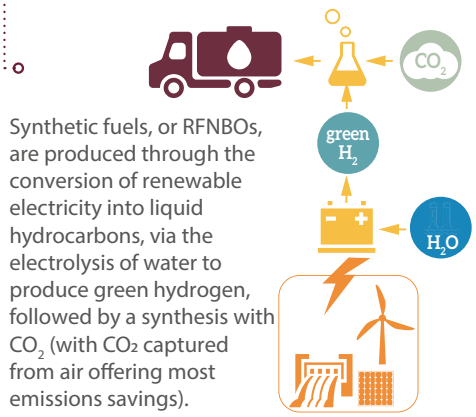
As part of the fit for 55 package to make the EU's policies fit for the EU's climate targets, on 14 July 2021, the European Commission presented a proposal to increase the production and use of sustainable fuels in aviation, also known as the ReFuelEU Aviation initiative. In the draft regulation, the Commission proposes placing obligations on fuel suppliers to distribute sustainable aviation fuels (SAFs) and growing the share of SAFs (including synthetic aviation fuels, also known as renewable fuels of non-biological origin (RFNBOs)) over time. This infographic offers a brief overview of the targets set by the Commission, types of fuels considered in the proposal, and their sustainability, market readiness, feedstock availability, production pathways and production cost projections.
More information on the proposal is available in the related EPRS EU legislation in progress briefing.

Fuel types and targets in the European Commission's legislative proposal

Biofuels
RED II - Part B of Annex IX
used cooking oil and animal fats (tallow)

Synthetic fuels
RED II - Article 2, second paragraph, point 36

Advanced biofuels
RED II - Part A of Annex IX
from forestry and agricultural residues, algae and bio-waste



Synthetic fuels, or RFNBOs, are produced through the conversion of renewable electricity into liquid hydrocarbons, via the electrolysis of water to produce green hydrogen, followed by a synthesis with CO_2 (with CO_2 captured from air offering most emissions savings).

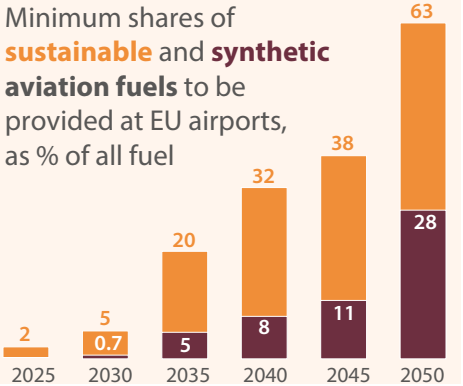
Forestry and agricultural residue

- **animal manure** and **sewage sludge**
- **palm oil mill effluent;** empty **palm fruit**
- **tall oil pitch** (from pine wood **pulping** distillation)
- crude **glycerine**
- non-food **cellullosic** material
- **ligno-cellullosic** material, except saw logs and veneer logs
  - **cereal** straw
  - grape **marcs** and **wine lees**
  - **bagasse** (**sugar cane pulp**)
  - **nut** shells
  - **grain** husks
  - **corn** cobs, without kernels

Algae and bio-waste

- **algae** from ponds or photobioreactors
- **biomass** fraction of municipal **waste**, excluding household waste with recycling targets
- **bio-waste** from private households' separate collection
- **biomass** fraction of industrial **waste**, not for use in feed or food chain, excluding used cooking oil and animal fats
- **biomass** from forestry and forest based **waste**

Minimum shares of **sustainable** and **synthetic aviation fuels** to be provided at EU airports, as % of all fuel



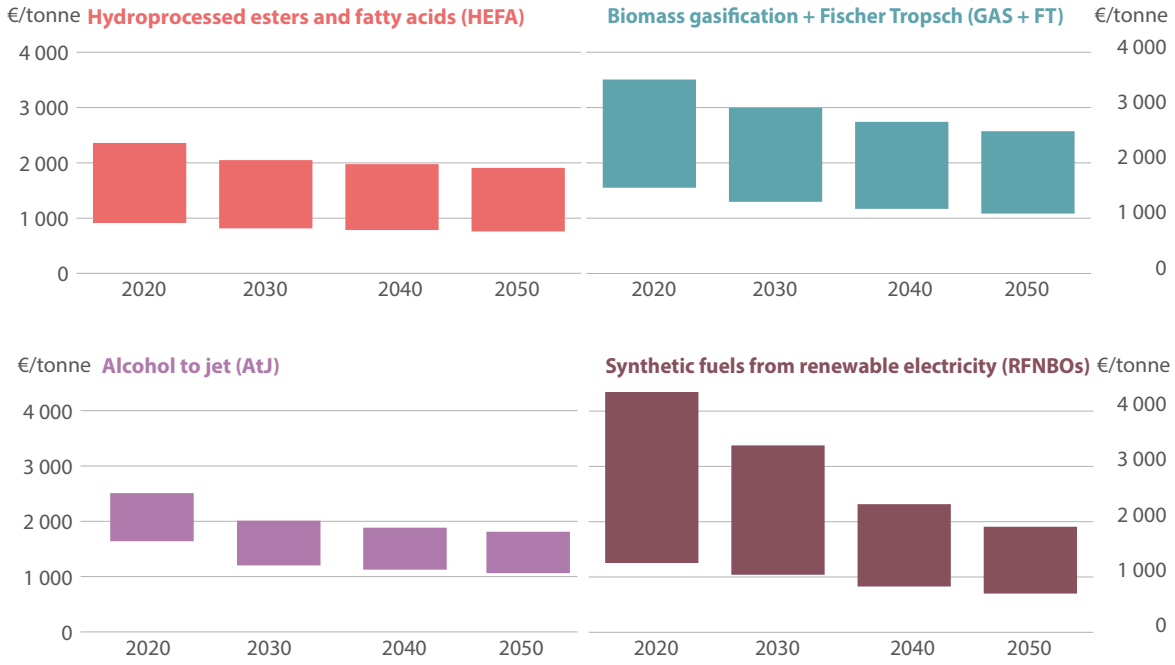
EPRS | European Parliamentary Research Service
Authors: Jaan Soone and Eulalia Claros
Members' Research Service
PE 729.333 - March 2022

EN

SAF: Sustainability, feedstock availability and production pathways

	Biofuels	Advanced biofuels	Synthetic fuels
Sustainability	Emissions savings expected at 85 % with used cooking oil and 76 % with tallow	Very high potential. Emissions savings expected at 94 % (forestry residues) and 91 % (biowaste)	Very high potential. Emissions savings expected at 100 % with CO_2 directly captured
Market readiness	Available for road transport on a commercial scale	Ongoing commercial pilots	In development
Feedstock or resource available[1]	Limited availability of used cooking oil and tallow. Strong competition from road transport	High potential availability. Potential competition from maritime transport	Growing share of renewable electricity in the EU energy mix. Potential unlimited availability of CO_2 directly captured
Production costs compared with fossil jet fuel	About twice the cost of fossil jet fuel	Around 2 to 4 times the cost of fossil jet fuel	3 to 6 times the cost of fossil jet fuel
Key production pathways[2]	Hydrogenated esters and fatty acids (HEFA) (e.g. refining animal fats from rendering plants and used cooking oil through a process that uses hydrogen)	Gas + Fischer-Tropsch (FT) synthesis (e.g. gasification of forestry residues then FT synthesis) Alcohol to jet (AtJ) (e.g. processing biomass to ethanol, then upgrading) HEFA (e.g. algae and tall oil)	Power to liquid (e.g. hydrogen from electrolysis, CO_2 capture, then FT synthesis and upgrading, or hydrogen from electrolysis, CO_2 capture, then methanol synthesis and conversion)

Estimated SAF production cost ranges across different production routes



Notes:
[1] O'Malley et al, Estimating sustainable aviation fuel feedstock availability to meet growing EU demand, ICCT March 2021, p. 4.
[2] Sustainable Aviation Fuel Monitoring System, study undertaken for the European Aviation Safety Agency, 2019, p.86.
Data sources: EU Legislation in Progress - ReFuelEU Aviation initiative. Impact Assessment of the RefuelEU Aviation initiative, (Annex 8, p. 117). Ch. Wolf: Ramping up Sustainable Aviation Fuels.